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REFLECTING TAPES FAIL TO REDUCE BLACKBIRD DAMAGE TO RIPENING CORNFIELDS

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Bird Scaring Reflecting Tapes[®] are 11-mm-wide mylar ribbons with silver and red colors on opposite sides. When stretched between poles, these tapes reflect sunlight and make a humming sound in a wind. During preliminary field trials conducted in Bangladesh, India, Philippines, and the United States, reflecting tapes reduced bird damage to corn, millet, sorghum, and sunflowers when placed in parallel rows 3-10 m apart (Bruggers et al. 1986). Dolbeer et al. (1986) showed that when placed in parallel rows 3-7 m apart, these tapes were effective in protecting ≤ 0.3 -ha fields of sweet corn, millet, and sunflowers from bird damage. Their observations indicated that red-winged blackbirds (*Agelaius phoeniceus*) and house sparrows (*Passer domesticus*) were repelled by the tapes, but mourning doves (*Zenaidura macroura*) and American goldfinches (*Carduelis tristis*) were not. However, Tobin et al. (1988) found that reflecting tapes spaced at 3-4 m were ineffective in protecting blueberries from damage by American robins (*Turdus migratorius*), European starlings (*Sturnus vulgaris*), and house finches (*Carpodacus mexicanus*).

No crop grown in the U.S. suffers greater economic loss from bird damage than does rip-

ening corn from red-winged blackbirds. This loss was estimated to be 12 million bushels in 1981 (Besser and Brady 1986). Yet corn is a low-value crop on a per hectare basis (Dolbeer 1981), so farmers cannot spend much money protecting corn from birds. Dolbeer et al. (1986) estimated that it would cost \$83/ha to install reflecting tapes from 3-m poles when the tapes were spaced 3 m apart. Few cornfields sustain enough bird damage to justify the use of these tapes at that cost (Besser and Brady 1986). If, however, tapes could be more widely spaced and remain effective, cost decreases dramatically. For instance, installing these tapes at 16-m spacing would cost only \$16/ha, using figures by Dolbeer et al. (1986). In this study, we examined whether bird damage to corn could be reduced by stretching widely-spaced (16-m) strands of reflecting tapes over cornfields.

METHODS

We conducted our experiments in 1985 and 1986 at the Tiffany Dairy Farm in Lyme, Connecticut, and in 1985 at the Lockwood Farm of the Connecticut Agricultural Experiment Station in Hamden. Six cornfields grown for silage were used both years at the Tiffany Farm. These fields ranged in size from 2 to 3

ha and were bordered by second-growth forest. At the Lockwood Farm, 2 fields (each 0.5 ha) were used. These fields were adjacent to apple orchards and fields of row crops. At these 2 farms, birds reduced the yield of corn grain by an average of 22% in 1979 and 1981 (Conover 1984) and 8% in 1982 and 1983 (Conover 1983). Over 90% of this damage was caused by red-winged blackbirds; common grackles (*Quiscalus quiscula*) were responsible for the rest (Conover 1984).

The experimental design was similar to that used by Conover (1983, 1984). We paired each cornfield with a similar cornfield based on planting date and proximity. Distances between paired fields ranged from 0.5 to 1.5 km. One field in each pair was randomly selected to serve as an untreated control (unprotected field), and the other served as an experimental field (where the reflecting tape was to be erected). Experimental fields were visually divided in half along the short axis. One half was randomly selected to serve as a control (unprotected side). Reflecting tape was suspended over the other half (taped side). We compared bird damage in taped sides and unprotected sides of experimental fields and in unprotected fields using a 2-way analysis of variance without replication (Zar 1974). Comparing bird damage in taped and unprotected sides of the same field should provide the most sensitive measure of effectiveness of reflecting tapes. However, because tapes on the protected side may scare birds from an entire field, comparing bird damage in the 2 sides of the experimental fields may underestimate the amount of protection provided by these tapes. This possibility was assessed by comparing damage in experimental fields with damage in unprotected fields.

We strung tapes, 100 m long, in parallel rows at 16-m intervals over the entire length of half of each experimental field. Tapes were erected by tying them from poles 4–5 m high, placed approximately 50 m apart. Tapes were twisted 20–40 times between poles. We erected tapes in mid-August either just before or after birds began to damage corn ears; tapes were left up 4–5 weeks until corn was cut for silage. We maintained records in 1985 on the time required to erect and maintain tapes.

We determined the percentage of ears damaged by birds by randomly locating 10 points on each half of the experimental fields and in unprotected fields (Conover 1984). We then examined the 10 closest ears to that point for bird damage. An ear was considered damaged by birds if the husk had been torn or shredded and ≥ 1 kernel was damaged. We collected these data at 3 different times: when the experiment began, approximately 2 weeks later, and 4–5 weeks later (when corn was scheduled for harvest). We always collected data from the taped and unprotected side of each experimental field and from the paired unprotected field on the same day.

The percentage of corn kernels damaged by birds was assessed immediately before corn was harvested. To achieve this, we randomly selected 18 points in each field (Conover 1984). At each point, the 10 closest ears were husked, and we estimated what percentage of kernels on each cob was damaged by birds (Woronecki

et al. 1980). These data were then averaged for each field.

RESULTS

Two people spent 35–45 minutes to erect a single 100-m line of reflecting tape; most of the time was consumed erecting posts and getting tape above the corn canopy. An average of 7.3 person-hours was required to tape 1 ha.

Tapes were vulnerable to high winds. In 1985, gusty winds in early September brought down half the lines. Repair time per 100-m line ranged from 20 to 40 minutes. During the next 4 weeks, only a single line broke. Then, just before the experiment's conclusion in 1985, a hurricane snapped every line.

By the time tapes were erected and the experiment had begun, birds had damaged a mean of 5% of corn ears in both taped and unprotected sides of experimental fields and 8% in unprotected fields ($F = 0.12$; 2,12 df; $P = 0.92$). Bird flocks observed feeding in these fields were comprised almost entirely (>95%) of red-winged blackbirds.

Two weeks later, 35% of corn ears in the taped sides were damaged by birds. This was not different ($F = 1.67$; 2,12 df; $P = 0.23$) from the 41% damaged in unprotected sides or 27% damaged in unprotected fields.

Immediately before corn was harvested, birds had damaged 40% of ears in taped sides, 44% in unprotected sides, and 35% in unprotected fields ($F = 0.85$; 2,12 df; $P = 0.51$). By this time, birds had damaged 5.9% of corn kernels on taped sides, 6.0% on unprotected sides, and 3.8% in unprotected fields ($F = 0.93$; 2,12 df; $P = 0.52$).

DISCUSSION

Placing parallel rows of Bird Scaring Reflecting Tapes in cornfields at 16-m intervals did not reduce damage by birds. Estimates of damage in taped and unprotected sides of experimental fields were similar. This similarity did not result from tapes deterring birds from

both sides of these fields because bird damage was not different in paired fields that were left unprotected as controls. Reflecting tapes were ineffective both at the end of the experiment (4–5 weeks) and after only 2 weeks of use. Hence, our data provide no evidence that tapes would have been more effective if used for a shorter period of time.

These results contrast with those of Bruggers et al. (1986) and Dolbeer et al. (1986) who found such tapes effective in protecting grain fields from damage by birds. Reasons for this difference are not entirely clear. Tobin et al. (1988) found tapes ineffective in protecting blueberries from birds and attributed much of the failure to the fact that bird species that damage blueberries are different from those that damage grain. Species differences, however, cannot explain why tapes failed to work in our experiment. Dolbeer et al. (1986) found the tapes effective against red-winged blackbirds, the species responsible for damage in our study.

The 1 major difference in our experiments and those of Bruggers et al. (1986) and Dolbeer et al. (1986) was in spacing between rows of tape. In earlier studies, rows of tape were spaced ≤ 10 m apart, whereas we used a width of 16 m. Possibly, the tapes would have been more effective in our tests if placed closer together, but this would have increased expense and labor. Even when spaced at 16 m, 7.3 hours/ha were required to erect reflecting tapes and approximately 2 hours/ha to maintain them. Assuming a labor cost of \$3.50/hour, it would cost \$32.50/ha for labor alone to use these tapes. This was much higher than our initial prediction of \$3.35/ha for labor based on figures provided by Dolbeer et al. (1986) for crops < 1 m in height. Much of this additional labor cost resulted from the need to get the tapes 4 m high in order to be above the corn canopy. Consequently, even if reflecting tapes had reduced bird damage, they probably would not have been cost effective.

Another liability of reflecting tapes is their

vulnerability to high winds. Twice in 1985, winds brought down $> 50\%$ of the lines. Hence, use of reflecting tapes should be limited to areas that are not prone to windy weather or thunderstorms unless poles are spaced close together to reduce stress on any 1 section of tape.

In summary, reflecting tapes spaced at 16-m intervals proved ineffective in reducing damage to field corn by red-winged blackbirds. A closer spacing of tapes would have been impractical because of costs. Our results indicate that these tapes will be cost effective only for high value crops that grow low to the ground and suffer considerable damage from birds.

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